HIGHLAND FLATS TREE FARM

WETLAND AND RIPARIAN MITIGATION

-2018 ANNUAL REPORT-

Prepared for

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1.0 INTRODUCTION

A Detailed Wetland and Riparian Mitigation Plan (Detailed Plan) was developed in 2016 for the Highland Flats Tree Farm (HF) in Naples, Idaho (ECW 2016a). The Detailed Plan described the activities to occur within three separate mitigation areas: the Headwater (HW) Restoration area, the Culvert Enhancement area (Culvert) and the Reservoir Mitigation Area (Reservoir). (See Figure 1 for mitigation area locations.) Hereafter, the three mitigation areas are referred to as the HW, Culvert and Reservoir areas, respectively.

Mitigation was implemented according to a staggered schedule, with mitigation completed in the Culvert, Reservoir and portions of the HW area (HW-2/upper HW-3a) in 2016. Mitigation within the remainder of the HW area was implemented in 2017 to allow time for weed control via solarization to occur (with some planting of seasonally unavailable plants in Spring 2018).

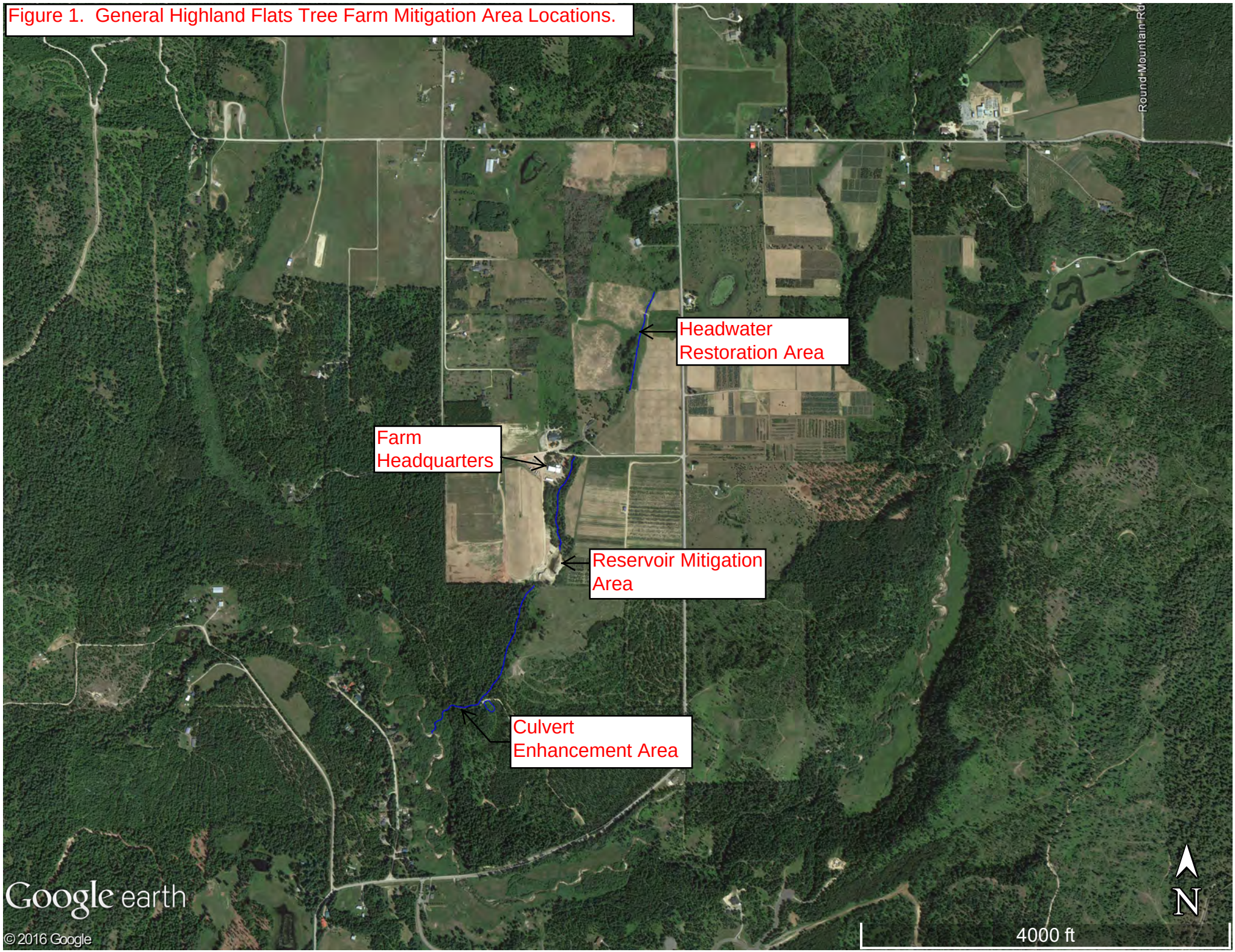
Because of the staggered implementation dates, 2018 represents the first post-construction year (Year 1) for most of the HW area and the second post-construction year (Year 2) for the Reservoir and Culvert areas. There was little difference in the types of maintenance activities conducted within the individual areas, although cover was generally higher in the mitigation areas completed first. Non-native invasive species were a concern in all areas, as well as maintenance of planted species vigor and prevention of herbivory. The main difference was that the planted woody species success criteria differ between Year 1 and Year 2. Survival is the success criterion regarding the woody species plantings in the HW area, with density the main criterion in the Reservoir and Culvert areas (although survival is still measured in Year 2 in these areas).

This report provides a summary of:

- Maintenance and remedial activities implemented in 2018,
- Final mitigation planting in Spring 2018,
- 2018 monitoring results and mitigation area condition descriptions, and
- Recommended Actions for 2019, including any additional remedial activities.

As a combined Annual Monitoring and Construction Completion Report, the report is organized as follows. Section 2.0 provides a summary of the maintenance and remedial activities conducted in 2018 and describes any changes from the Detailed Plan. Because similar activities proceeded concurrently on all sites, the implementation details are described by activity. Section 3.0 describes the final mitigation planting. Section 4.0 provides the monitoring results for the all mitigation areas and compares the results to the appropriate success criteria. Section 5.0 provides an overall project summary, a description of any necessary 2019 remedial activities, and a 2019 maintenance and monitoring schedule.

Figure 1. General Highland Flats Tree Farm Mitigation Area Locations.



2.0 MAINTENANCE AND REMEDIAL ACTIVITIES

2.1 Weed Control

Reed canary grass (*Phalaris arundinacea*, hereafter referred to as RCG) and common tansy (*Tanacetum vulgare*, hereafter referred to as tansy) were the primary non-native invasive species of concern and weed control focused on manual removal of these species.

The RCG cover was low in HW-3a and 3b following the extended solarization period. However, some RCG re-established along the HW-2 channel and 2016-graded portion. These RCG stems and roots were manually removed during May and June, with RCG in adjacent areas cut to prevent flowering/subsequent seed shed into the mitigation area. Conversely, tansy re-established readily within the HW mitigation area where the extended solarization had occurred. A large scale HF field crew removal effort was very successful in reducing the tansy to a minor cover component. Overall, between 1 and 3.4% combined RCG and tansy cover was observed in the HW area at the end of the growing season. Some re-establishment of the invasive creeping foxtail (*Alopecurus arundinaceus*) was observed in HW-3a. The creeping foxtail was also manually removed where observed.

Both the HW-1 buffer and areas to the west of the HW-3a and 3b mitigation areas contain RCG. These areas were trimmed twice during the growing season (June and August) with a hand-held weed-eater to prevent any flowering stems from forming. The tansy in the HW-1 buffer and along the HW access road was either trimmed to prevent flowering or manually removed. All stems, roots, rhizomes and other plant parts were immediately bagged and removed from the area to the designated weed disposal area.

There was some regrowth of RCG from the access road into the Culvert area. The RCG was removed manually during July and solarization material placed along the road to prevent the roadside RCG from continually growing into the mitigation area. No RCG remained following this treatment.

Following two years of substantial RCG control efforts around the Reservoir, the species was sparse, but still present early in the growing season (1-5% cover). Additional RCG manual removal occurred during July and August. As for 2017, some removal was accomplished via shoreline access, with the majority of the RCG removal switched to a water-based access via a paddleboard to prevent trampling of adjacent native plants or damaging the underlying soils. Milfoil removal also occurred in early August. All parts of the reservoir were subject to manual removal of both RCG and milfoil, including the shoreline and open water outside of the designated mitigation areas.

All manually removed weeds were placed in covered plastic bins or closed heavy duty trash bags and placed in the designated weed disposal area.

2.2 Temporary Irrigation

The HW area irrigation system installed in 2017 was expanded in 2018 to water all of the 2016 and 2017 planted trees and shrubs. The irrigation used a gravity-feed system from six approximately 500-gallon tanks on stands. Approximately 8,000 gallons of water were applied weekly via drip lines (a rate of 1 inch/week). The water was applied according to a zoned system in which wetland plants, such as willows, received more water than more drought tolerant plants like snowberries.

HW irrigation began in June, but was not fully functional until July, with many of the shrubs being watered by hand until irrigation system completion could occur.

The Culvert area was not irrigated in 2018 and no irrigation will be necessary in subsequent years, absent a severe change in conditions.

2.3 Other

Precipitation during the 2018 Water Year from October through April was 130% of the long term average (Appendix A). Although not as wet overall as the 2017 Water Year, precipitation was particularly high in April and June. The wet spring combined with (1) the newly exposed soil following solarization removal in HW-3a and 3b, and (2) the proximity of mature cottonwood (*Populus balsamifera*) trees in the HW Reference area resulted in an abundance of naturally-establishing cottonwood seedlings in HW-3a and portions of 3b.

Although heavily grazed by ungulates, the volunteer seedlings exhibited high vigor. To assist in meeting the long term native plant cover requirement, an exclosure was constructed in July around the area in which the greatest concentration of naturally establishing cottonwoods occurred. The exclosure extended from the HW access road to the unnamed stream channel (approximately 50 feet wide) and extended 110 feet along the road. More than 200 cottonwoods were tallied in the exclosure. The cottonwoods in the exclosure more than doubled in height within a 6-week time period (see Figures C-7 and C-8).

As a result of this success, two additional exclosures were constructed encompassing another estimated 300 cottonwood seedlings. The new exclosures were 125 and 74.5 feet long along the access road and also extended to the channel. Corridors were left between exclosures for ungulate passage to and from the heavily used HW Reference area. In addition to protecting the naturally establishing cottonwoods, all of the aspen (*Populus tremuloides*), 90% of the planted cottonwoods and most of the dogwoods (*Cornus sericea*) fell inside the exclosures. These taller plants had outgrown their anti-herbivory cages requiring new caging to protect against ungulate herbivory. In lieu of new individual plant cages, the existing cages were removed once plants within the exclosures entered dormancy.

2.4 Remedial Activities Implemented

Three unexpected issues arose during 2018 that required remedial activities. These items are described below according to the specific issue, the actions taken to resolve the issue, the results, and if additional remedial action remains. Supplemental planting to increase long term cover, assist in shading out non-native plants, and increase habitat structure was identified in 2017 as a remedial activity to occur in Fall 2017 and Spring 2018. This planting is described in Section 3.0.

Other previously-identified weed control remedial activities, such as shifting from weed eradication in HW-1 to an ongoing program of periodic RCG and tansy cutting to prevent flowering/seed set, were incorporated into the site general maintenance and discussed in Section 2.1. Table 1 provides a summary of all maintenance, remedial and planting activities conducted in 2018.

Table 1. 2018 Mitigation Maintenance and Planting Dates.

Task	**Month**	
	Anticipated Dates[1]	**Actual Dates**
Maintenance		
Install irrigation in rest of HW area	March/April	June-July
Run Irrigation	April-September	July-September
Weed Control-HW mitigation areas	May-August	May-August
Weed Control HW-1 Buffer	June-August	June-August
Weed Control-Culvert	May	July, as only minor amount of RCG
Weed Control-Reservoir	May, July-August	July-August, water level too high for weed control in May
Implement Contingency	• Replant rodent-killed aspen May • Treat beetle infestation aspen and cottonwoods July • HW planting basin clearing July-August	
2018 Planting		
Plant HW willows, conifers and stored shrubs	March/April depending on availability	April 19-22
Re-Seed HW-3a and 3b	October-November, depending on weather	November 9-10

[1] All dates were estimated and dependent on actual weather conditions and annual changes in phenology for implementation. Implementation dates for seeding and planting provided by HF staff.

2.4.1 Remedial Action 1: HW Area Rodent and Insect Herbivory

Issue: A few of the planted aspen stems in the HW area were damaged by rodents during the winter, resulting in mortality. A beetle infestation affecting only planted cottonwoods and aspens was also observed in the HW area in late June resulting in lower than desired vigor. No beetle damage was observed on the volunteer cottonwoods.

Actions Taken: The rodent-damaged aspen were replaced along with additional extra bundle plants. Trees and shrubs were periodically re-evaluated throughout the growing season to identify if the aspen loss represented an isolated incident or if additional protective actions may be necessary for the HW area.

An organic pepper spray was applied twice to control the beetles affecting the cottonwoods and aspens.

Results: No additional loss of aspen and cottonwoods occurred, with the treated plants recovering well after they were sprayed. No additional rodent issues were observed.

Additional Remedial Action: None necessary, other than routine monitoring in 2019.

2.4.2 Remedial Action 2: HW Area Trefoil-Lotus Competition with Planted Trees and Shrubs

Issue: Bird's-foot trefoil (*Lotus corniculatus*), white clover (*Trifolium repens*) and vetch (*Vicia villosa*), components of an erosion control mix on the HF site established well within portions of the HW mitigation area, particularly around the planted trees and shrubs where irrigation water was supplied. Their extensive growth affected the ability of the planted species to obtain the necessary irrigation water and prevented the desired deep soil infiltration of the applied water.

Actions Taken: A minimum 6- to 8-inch planting basin was cleared around each planted tree/shrub and maintained free of all herbaceous plants for the remainder of the growing season.

The area encompassed by exclosures to increase both planted and volunteer cottonwood growth and its associated shade was increased (see Section 2.3).

Results: Planted tree and shrub vigor increased. The amount of irrigation water needed decreased as the irrigation efficiency increased.

Additional Remedial Action: Actions to be undertaken in Spring 2019 include (1) planting additional conifers in the HW-2, 2016 graded area and in the west upland buffer of HW-2, 2017 graded, and (2) regular clearing of wide planting basins where the trefoil-clover mix is dominant, leaving the planting basins narrow where the native grasses occur.

2.4.3 Remedial Action 3: Reservoir Area Waterfowl Herbivory

Issue: Bulrush sod cover declined substantially in midsummer after early vigorous June growth was observed. Waterfowl herbivory appeared to be the primary cause, particularly between the end of June and the end of July. However, high early spring reservoir water levels may have also affected the bulrush. Figure 2 compares the Upper Reservoir growing season water levels from the time of staff gage installation in July 2016 to September 2018.

A few hydrological items stand out:

- The Upper Reservoir water level at the gage dropped to 0 at the end of the 2016 growing season, but remained near or above 1.0 foot in depth in the two subsequent years.

- The Upper Reservoir water levels exceeded 4.2 feet in 2018, greater than in 2017. However, in both 2017 (in which the bulrush flourished) and 2018 (in which the bulrush declined), water levels were at 3.3 feet by the end of June and generally followed a similar pattern of water level decline.

HF staff noted that waterfowl remained on the reservoir for a longer period than usual in 2018. Instead of using the reservoir as a migratory stop-over as in previous years, waterfowl stayed on-site through mid-summer, not leaving until the end of July.

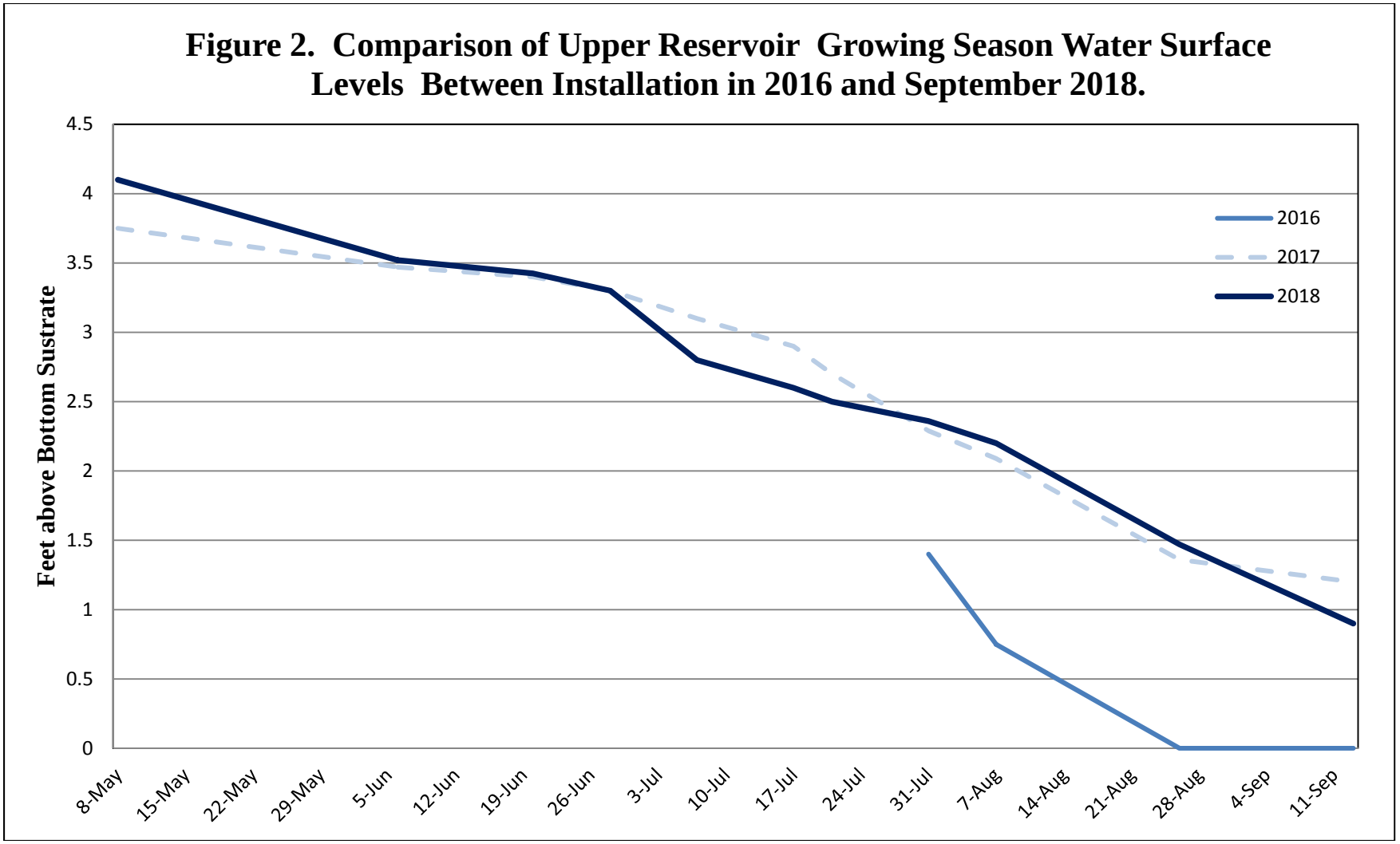
Reservoir water was not used for distillation purposes in 2018, and although the amount of water previously used was small, it is possible that the pump and discharge noise had been sufficient to deter prolonged waterfowl use.

Actions Taken: No waterfowl remained on the reservoir in July. To help promote growth on the damaged stems, approximately 1,000 gallons of water were immediately removed from the reservoir to lower the water level and expose all shoots, with an ongoing program to remove 500 gallons/week until the upper gage water level dropped to less than 2.0 feet.

Results: Marginal new growth was observed.

Additional Remedial Action: The native herbaceous cover for all areas below the OHW was 33.2%, meeting the Year 2 success criterion. However, the bulrush decline in the deeper marsh areas may prevent subsequent year cover requirements from being met (40% in 2019, 80% by 2021). It is possible that the bulrush may recover from the waterfowl damage, or that other native plants may expand into the deep marsh. The need for remedial planting should be re-assessed in early 2019 to allow the potential for bulrush recovery to occur. Along with that assessment, implementing measures to discourage Canada geese from lingering, such as running the recirculating pump to provide some mild background noise, or initiating an earlier managed drawdown to expose the remaining bulrush earlier, could be fruitful. If re-planting is needed, immediate installation of anti-goose herbivory measures is recommended.

Figure 2. Comparison of Upper Reservoir Growing Season Water Surface Levels Between Installation in 2016 and September 2018.



3.0 2018 PLANTING

3.1 Overview

The mitigation area planting was completed in Fall 2017, with the exception of 233 HW area plants and 50 Reservoir supplemental plants that were either suddenly unavailable from the nursery due to weather conditions, or stored by HF when fall planting was halted by snow. The HW plants were placed as soon as they were available, which was between April 17-19, 2018. In addition, 2017-planted aspens damaged by overwinter rodent activity were replaced in May 2018. In both the Fall 2017 and Spring 2018 plantings, most extra bundle plants were placed in the HW area. As a result, the number of woody plants placed exceeded the specified planting number.

The 50 additional willows slated for Spring 2018 planting around the Reservoir were not available from the supplier, and notice of unavailability was not provided until April. The willows were being planted to increase scrub-shrub cover, not percent survival. Naturally-establishing alder growth was able to provide the needed additional cover and the wet spring promoted substantial growth of the remaining willows. As a result, no additional willows were identified as being necessary for increased shrub cover.

Survival of the originally planted trees and shrubs at the Culvert decreased slightly overwinter to 88.6%, primarily as a result of heavy ungulate herbivory, including some by moose. Additional shrubs were transplanted into the area in May 2018 to both compensate for the loss and increase cover. With the original and supplemental planting a total of 125 plants were placed in the Culvert area. Post-supplemental planting, there were 114 alive planted trees and shrubs, the same number as originally planted.

Appendix B contains a tally of all plants placed during Spring 2018, as well as all plants previously placed. The extra bundle plants were excluded from the tally as the survival criteria are based on the percent survival of the specified number of plants, not all plants placed.

No remedial planting was required in 2017 for the purposes of meeting the Year 1 survival criteria. Supplemental planting to assist in shading out non-native plants and increase habitat structure occurred in April 2018. The supplemental planting consists of the following items:

- Five western red cedar (*Thuja plicata*) were planted along the northeast reservoir margin to provide shade over the non-native, but allowable trefoil-lotus hillside erosion control mix. This was two more than the three specified.

- Three lodgepole pine (*Pinus contorta*) were planted in the 2016-graded portion of HW-2 for the same reason as above.

- Ten ponderosa pine (*Pinus ponderosa*) were planted east of the HW-1 channel to assist in shading out the upland weeds, and nine coyote willows in the channel to shade the wetland RCG.

4.0 MONITORING

4.1 Overview

4.1.1 Monitoring Protocols

The monitoring protocols identified in the Detailed Plan were adhered to with the following exceptions:

- Additional herbaceous plots were added, as in 2017, where patchy herbaceous cover occurred, such as in the 2016-graded portion of HW-2.

- The linear shrub plot specified in the Detailed Plan failed to adequately characterize the shrub layer in the HW area and was changed to a circular plot (15 foot radius).

Five new data points were added in HW-3a and 3b and two in HW-2, 2017-graded to characterize the areas in which mitigation was just completed, as per the Detailed Plan. The transect and some of the additional plot data were not included in the September 2018 monitoring visit memorandum, but are included herein. As a result, some of the cover values may vary slightly from the preliminary report.

Monitoring data collection occurred between May 8 and 11, June 26 to 29 (for 2018-planted trees and shrubs) and between September 13 and 16, with a fourth site visit occurring at the end of July to review irrigation and weed control adequacy.

4.1.2 Success Criteria

The post construction performance criteria vary by year. The Year 1 success criteria apply to areas in which mitigation was completed in 2017 and the Year 2 success criteria apply to the areas in which mitigation was completed in 2016. The exception is that, in spite of the staggered implementation in the HW area, Year 1 success criteria apply to all of the HW area, as the majority of the mitigation was not completed until 2017 (Spring 2018 for seasonally unavailable plants).

- **Success Criteria 1a (Yr 1) Applies to HW area**: Planted woody species in the wetland and/or riparian areas at the sites will achieve at least 80% survival one year after the site is planted. If 80% survival is not achieved, all dead woody plantings are to be replaced, and the 80% performance measure will apply to the new plantings for the following growing season.

- **Success Criteria 1b (Yr 2) Applies to Culvert and Reservoir areas**: Native woody species (planted and volunteer) will achieve the following average densities of at least:

    - 435 plants per acre in the wetland and/or riparian areas of the Culvert Enhancement area.

- 1,393 plants per acre in the planted wetland and/or riparian areas within the Reservoir Mitigation area (equivalent to 80% survival at a planting density of 1,742 plants/acre).

- **Success Criteria 2 (Yr 1 and 2) Applies to All Mitigation areas**: Non-native invasive weeds will provide 10% or less cover.

- **Success Criteria 3 (Yr 2) Applies to Reservoir Area Only**: Native herbaceous plants will cover 33% of the Upper Reservoir area at or below the OHW line.

An overall description of each mitigation area's condition is provided in Section 4.2. The degree to which each individual success criterion was met is evaluated in Sections 4.3 through 4.5.

4.2 Mitigation Area Condition

4.2.1 HW Area

The HW area mitigation was implemented over two years and the habitats are still developing. As a result, the area is described below by individual HW section. In subsequent years when habitat type success criteria are required, results will be provided by habitat type, with any differences in target habitats between mitigation subareas identified.

HW 2/Upper HW-3a, 2016 Graded (also referred to as HW-2, 2016-graded). There was substantial growth of the originally seeded grasses in the early spring, with the seeded grasses providing up to 26.7% cover and bryophyte establishment providing another 5% cover in wetter areas. However, by midsummer, the trefoil-clover mix became dominant (see Figures C-1 and C-2). At the end of the growing season, total cover was 65.9%, of which 63.9% was herbaceous cover and 2.0% shrub cover. The herbaceous cover was dominated by the trefoil-clover mix (45.4 %), with seeded grasses providing 17.5% cover. As for 2017, the herbaceous cover was patchy, with areas dominated solely by the seeded grasses and areas dominated solely by the trefoil-clover mix.

Shrub cover was similar to that of 2017 for a couple of reasons:

- The temporary irrigation was not started until mid-July, resulting in some woody plant dieback, and

- There was strong competition from the trefoil-lotus mix for both water and light, as some of the trefoil and vetch began growing up onto the anti-herbivory cages.

Shrub vigor was low early in the year, improving substantially when the trefoil-clover mix was cleared in wide planting basins around the shrubs.

Non-native invasive species cover was low, as was that of native species other than the seeded grasses (both less than 1%). Relative native cover was 30.4% (28.2% including only herbaceous species).

HW- 2, 2017 Graded. Total cover was 32.5%, of which 20.0% was herbaceous cover and 7.5% shrub cover. Seeded grass germination was much higher in the 2017-seeded portions of HW-2 than those seeded in 2016. The seeded grasses dominated the herbaceous layer, with relatively minor amounts of the trefoil-clover mix. The monitoring plot grass cover was lower than the full area cover due to some inadvertent planting basin clearing in the mitigation subarea. Outside the plots, seeded grass cover was up to 40%.

Meadowsweet (*Spirea douglasii*) was the dominant shrub species in the monitoring plots and provided the greatest cover. All shrub species exhibited high vigor, with the meadowsweets and coyote willows (*Salix exigua*) close to exceeding the height of their anti-herbivory cages. The lodgepole pine in the mitigation area grew well. Conversely, the ponderosa pine in the upland area placed to help provide shade did not, likely because of the relatively poor, compacted soil in the adjacent upland buffer (i.e., outside of and above the graded area).

RCG and tansy provided 1.2% cover. There were no other non-native invasive species. Relative native cover was 70.0%.

HW-3a. This section of the overall HW mitigation area is the wettest of the HW sections, with ponding in depressions persisting well into June. Total cover was high at 74.1%, of which 65.4% was herbaceous cover and 8.7% shrub cover. Shrub cover included a mix of planted woody species and cottonwood volunteers. Most of the shrub cover was provided by black cottonwood, meadowsweet and Bebb's willow (*Salix bebbiana*). However, all planted and volunteer species exhibited good vigor, including the planted conifers (lodgepole pine, ponderosa pine and red cedars).

The seeded grasses were slow to establish and the spring cover was dominated by a mix of poverty rush (*Juncus tenuis*), western cudweed (*Gnaphalium palustre*), popcorn flower (*Plagiobothrys leptocladus*), and linear-leaved candyflower (*Montia linearis*). These species were replaced in many areas during the summer by bird's foot trefoil, white clover, and vetch. At the end of the growing season, the seeded grasses and other native species provided 34.2% cover, with the trefoil-clover mix providing 30.0% cover. Herbaceous cover was patchy with some areas of only native species and some areas solely dominated by the trefoil-clover mix.

Non-native invasive species in the area included RCG, tansy, and creeping foxtail. After control, the average non-native invasive species cover was 1.2%, with some patches of higher cover.

Overall relative native cover was 57.9% (52.3% including only herbaceous species).

HW-3b. The HW-3b data point was installed in Spring 2018 to be representative of the area. However, when the first exclosure was constructed, the data point ended inside the exclosure within an area dominated by planted hawthornes (*Crataegus douglasii*), meadowsweet and

volunteer cottonwoods. As a result, a second HW-3b data point was added outside of the exclosure in an area dominated by planted snowberries (*Symphoricarpos albus*). The understory also varied among the two data points as the exclosure data point contained a mix of senesced vernal pool plants and trefoil-lotus mix. Outside the exclosure, the seeded grasses dominated the understory.

Total cover was 60.4%, of which 54.4% was herbaceous cover and 6.0% shrub cover. Shrub cover varied from 11.0% in the exclosure plot to 1.0% in the plot outside of the exclosure, reflecting both the extra growth with full herbivory protection and the difference in shrub species composition (i.e., the species within the exclosure are naturally faster growing and larger than the snowberries outside it). All planted and volunteer woody species exhibited high vigor, including the ponderosa pines in the upland riparian habitat.

The seeded grasses provided an average of 35.0% cover in HW-3b, with grass cover of 50.0% in the plot outside of the exclosure. The grass cover decreased to 20.0% in the exclosure, as the trefoil-lotus cover increased. The trefoil-lotus cover averaged 15.0%.

There were no RCG or tansy in the HW-3b monitoring plots. However, there was some scattered cover of the two species in HW-3b. Overall relative native cover was 75.2% (72.4% including only herbaceous species).

HW Area Summary. Overall HW area planted tree and shrub vigor ranged from good (aspen, planted cottonwood, snowberry) to very high (Bebb's willows, meadowsweets, hawthornes and dogwoods). Coyote willow vigor was variable, with the species expanding laterally and sending up side shoots in the HW-2, 2017-graded area, but dying back elsewhere. Shrub vigor was lower in the HW-2/upper 3a, 2016-graded area, likely as a result of a later irrigation start than for other areas and a dramatic expansion of the trefoil-clover mix.

Total cover varied from 32.5 to 74.1% . The relative percent native cover ranged between 30.4 and 75.2%, with the highest relative native cover in the HW-2, 2017 graded and HW-3b areas, and the lowest in the HW-2, 2016 graded area.

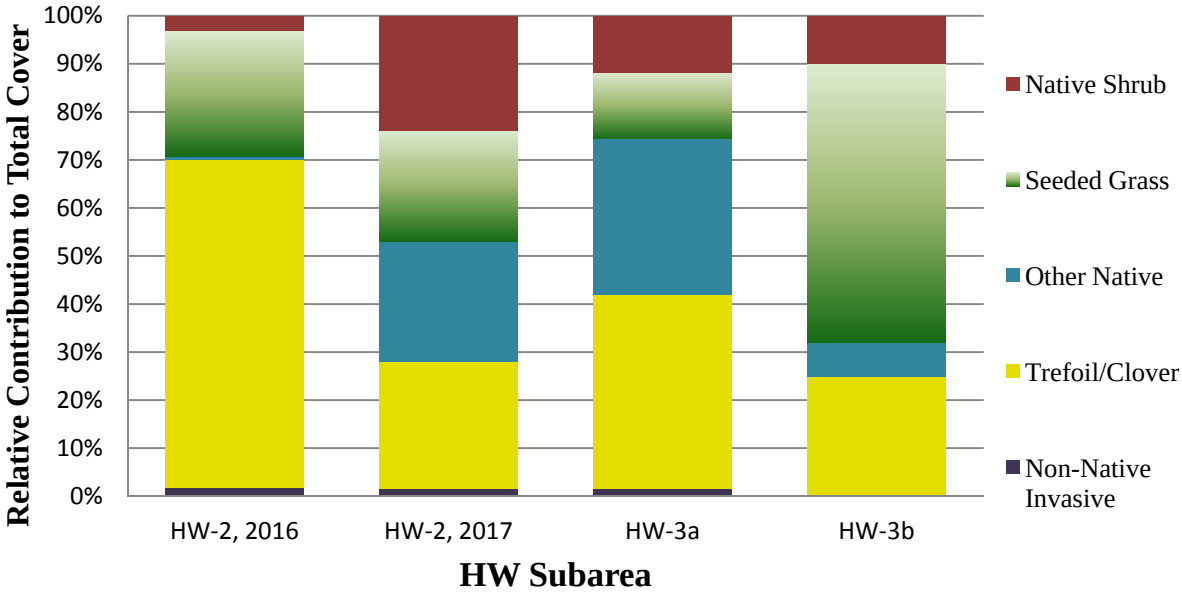
Figure 3 depicts the different contributions of shrubs, native, seeded grasses, other native plants, the trefoil-clover mix, and non-native invasive species to total cover. As shown in Figure 3:

- Shrub cover was equal to or greater than 6% in all areas except the HW-2, 2016-graded subarea.

- A large part of the difference in the percent native cover among subareas reflected the differences between the seeded grass dominance and the trefoil-clover mix dominance.

- Non-native invasive species cover was uniformly low, although with some small patches of higher cover.

Figure 3. Relative Percent Cover by Different Functional Groups in the HW Area.



4.2.2 Culvert Area

As per the Detailed Plan, each of the six individual planting areas functioned as a monitoring plot. The cover values summarized in this report represent within-plot cover and don't include the upslope overhanging canopy, previously identified as providing up to 25 to 30% cover (ECW 2016a).

Total cover was 69.4%, of which 59.4% was herbaceous cover and 10.0% shrub cover. Although shrub cover was 10% overall, along the channel where planting was concentrated, shrub cover ranged between 10 and 30%, with a mean channel shrub cover of 17.5%.

Total native cover was 61.9% (89.2% relative cover). The cover was provided by both naturally establishing and planted trees and shrubs. Dominant herbaceous species included streamside violet (*Viola glabella*) and skunk cabbage (*Symplocarpus foetidus*) in the spring, shifting to lady fern (*Athyrium felix-femina*), horsetail (*Equisetum* spp.), and tall mannagrass (*Glyceria grandis*) in the late summer. Red-osier dogwood, speckled alder (*Alnus incana*) and black cottonwood provided the greatest cover in the shrub layer. There were no RCG or tansy within the mitigation area. The early seral, non-native trefoil-clover mix provided 7.5% cover, similar to that of 2017.

Shrub vigor was very high with many of the speckled alders and dogwoods exceeding their six-foot-tall anti-herbivory cages. The alders grew up to 12 feet tall. The meadowsweet and cottonwoods were not as tall, but the meadowsweet produced abundant flowers indicating

healthy plants. No woody species in the planting areas reached the 1 inch stem diameter size required for classification in the tree layer.

4.2.3 Reservoir Area

Reservoir area total cover was 50.9%, of which 40.8% was herbaceous cover and 10.1% shrub cover. Shrub cover was dominated by the naturally establishing, and very fast growing alder, some of which were close to a 1 inch stem diameter (i.e., tree size). The remaining planted coyote willows also grew well, providing 2% of the shrub cover and beginning to initiate side shoots. Additionally, there were a number of naturally-establishing cottonwoods and Bebb's willows in 2017 that survived with additional growth in 2018. Vigor was high for all shrub species.

Native herbaceous cover was slightly higher than that of 2017 (33.2 and 30.8%, respectively), with some changes in dominant species composition. In particular, bulrush (*Schoenoplectus acutus*) declined as waterfowl herbivory between the end of June and July substantially impacted the species, decreasing its deep marsh cover to less than 10%. Conversely, cattail (*Typha latifolia*) cover increased and expanded the area of the reservoir in which it occurred. Water plantain (*Alisma plantago-aquatica=Alisma triviale*) remained ubiquitous throughout, and sword leaf rush (*Juncus ensifolius*, spikerush (*Elocharis palustris*), and sedges (*Carex* spp.) were locally abundant. Cover in the installed sedge sod mats remained high.

There was no RCG either within the designated Reservoir mitigation areas, or elsewhere along the reservoir at or below OHW. The 7.6% non-native, invasive species cover was comprised entirely of milfoil (*Myriophyllum spicatum*), which, although substantially reduced in 2017, was likely reintroduced in 2018 by waterfowl that also stopped at the heavily-infested nearby McArthur Lake Wildlife Management Area.

No trefoil-lotus mix occurred in the monitoring plots and the overall cover within the mitigation area remained similar to that of 2017 (approximately 4.0% within the PSS/PEM area based on a whole area relevé). The red cedars planted to shade out the trefoil-clover mix grew approximately 9 inches (for a total height of just over a foot) and should begin to help shade out the early seral mix in a couple of years.

4.2.4 Upland Buffer Areas

No monitoring plots were established in the HW-1, HW-2 or Reservoir buffers for quantitative data collection. The buffers were examined during each site visit for the presence of RCG or tansy seed heads and the success of trees planted to increase shade. The non-native species were successfully prevented from flowering and were otherwise cut back/manually removed.

Planted species survival in upland buffer areas was variable. All three of the planted red cedars in the reservoir buffer (plus two extra plants) survived and produced vigorous growth. The ponderosa pines planted in the HW-1 and HW-2 upland buffers to increase shade did not fare as well, with 10 of the 16 planted pines surviving and with the survivors exhibiting low vigor.

Their low vigor was in contrast to the higher ponderosa pine vigor observed in the HW-3b upland riparian area, likely reflecting soil and depth to water table differences. The in-channel willows in the HW-1 buffer also did not survive. However, the repetitive cutting back of the non-native species resulted in expansion of the existing native shrubs.

4.3 Success Criteria 1a: Woody Plant Survival

- **Planted woody species survival to be least 80% in the HW area.**

Although the survival success criteria applied only to the HW area in 2018, the Detailed Plan specified the collection of survival data in all areas during the first two years post-construction as a way to identify remedial measures if the Year 2 density criteria was not met. As a result, survival data is provided below for all mitigation areas and subareas, with the criterion applying only to the HW area and the data used to interpret density results (as necessary) for other areas.

Woody plant survival was high in the HW area (93.6 to 100%, Table 2). In the HW-3a subarea, there was some loss of willows, cottonwoods and hawthornes in the early summer, but extra bundle plants had been placed in this area, and the aspen killed by overwinter rodent activity re-planted. As a result, the net number of planted trees and shrubs in this subarea was greater than the target number (i.e., 598 woody plants at the end of 2018, three more than the target of 595).

Table 2. Wetland and Riparian Plant Survival and Density (where applicable) in the Highland Flats Mitigation Areas.

Mitigation Area	Fall Survival (%)		Density (# stems/acre)	
	2017	2018	Required #	Total #
HW-2/Upper HW-3a, 2016 Graded	95.4%	93.6%	NA	NA
HW-2, 2017 Graded	NA	97.6%	NA	NA
HW-3a	NA	100.0%	NA	NA
HW-3b	NA	96.7%	NA	NA
Culvert	91.2%	100.0%	435	983
Reservoir	80.0%	70.0%	1,393	2,691-5,937*
TOTAL WETLAND/RIPARIAN	92.3%	97.4%	NA	

*The range of numbers is from a tally of only larger alder, Year 2 naturally-establishing cottonwood, and planted willow stems to all woody stems. Because a very dense alder thicket has developed, it is likely that stem density will naturally reduce over time from the upper stem numbers to the lower number.

Likewise, in the Culvert area, several extra plants were transplanted into the area in June. With these plants, the total surviving number was 114, providing a net 100% survival (i.e, The original

planting called for 114 trees/shrubs; with the original and supplemental planting, a total of 125 plants were placed, so that a loss of 11 plants resulted in a total of 114 plants).

Reservoir survival was lower, at 70%. However, the relatively high water levels through July led to vigorous growth of the remaining willows. The naturally establishing alders continue to grow as well, exceeding 12 feet in height, with some of the young plants close to 1 inch in diameter (or tree stature). One of the reasons for willow loss is shading and competition from the alders. In 2018, the woody plant success criterion switches from survival (in which only the planted shrubs are counted) to density (in which both planted and volunteer shrubs are counted).

Conclusions: The HW survival success criterion was met and supplemental planting is not necessary to meet this criterion.

4.4 Success Criteria 1b: Woody Plant Density

- **Native woody species (planted and volunteer) will achieve the following average densities of at least:**
    - 435 plants per acre in the wetland and/or riparian areas of the Culvert Enhancement area.
    - 1,393 plants per acre in the planted wetland and/or riparian areas within the Reservoir Mitigation area (equivalent to 80% survival at a planting density of 1,742 plants/acre).

The Culvert and Reservoir areas were each less than 1 acre and the number of tallied trees and shrubs required to meet the target density were identified by multiplying the mitigation area acreage by the target density. Conversely, the tallied number of woody stems was divided by the area acreage to achieve the actual density per acre.

In the Culvert area, there were 40 pre-existing riparian wetland trees and saplings with an additional 24 shrubs in or adjacent to the planting areas[1]. The tally of these plants, shrubs that re-sprouted following the dam failure and associated flood/initial sediment deposits, and the planted trees and shrubs equaled 295. This number equated to a density of 983 stems/acre (i.e., 295 divided by 0.30), greater than the required density of 435 stems/acre (see Table 2).

There were 0.036 acres designated as suitable for shrub planting in the Reservoir mitigation areas. With a required density of 1,393 plants/acre, this equated to a target of 55 trees or shrubs. Although willow survival was lower than in 2017, with only 35 surviving, there were 179

[1]The upland snowberry patches and large, heavily browsed cottonwood seedling patch were excluded from the tallies.

volunteer alders, cottonwoods and Bebb's willows[2] for a total of 214 woody stems. Because a dense alder thicket developed with many small stems and a few much larger ones, it is likely that the thicket will self-thin over time, with only the larger alders remaining. There were 62 larger naturally establishing plants. With the 35 willows the total larger stem tally was 97.

Regardless of whether the larger stems (most likely plants to survive over the long term) or all woody plants are included the total number of stems (97 to 214) exceeds the target of 55. Converting the counts to densities results in densities of 2,691 to 5,937 plants/acre, greater than the required 1,393 plants/acre.

Conclusions: The Culvert area density of 983 woody stems/acre exceeded the density target of 435 woody stems/acre. The Reservoir densities of 2,691 to 5,937 plants/acre exceeded than the required 1,393 plants/acre. The success criteria were met and supplemental woody species planting is not necessary.

4.5 Success Criteria 2: Non-Native Invasive Weeds

- **Non-native invasive weeds to provide 10% or less cover.**

In the HW area, the RCG cover was low following the extended solarization period. However, some RCG re-established in the HW-2, 2016 subarea and tansy re-established readily within the HW mitigation area where the extended solarization had occurred. At the end of the growing season and following control, non-native cover averaged between less than 1 to 1.2% in the monitoring plots, with scattered patches of higher RCG and creeping foxtail cover.

There was some regrowth of RCG from the access road into the Culvert area. The RCG was removed manually during July, and solarization material was placed along the road to prevent the roadside RCG from continually growing into the mitigation area. No RCG remained following this treatment.

Following two years of substantial RCG control efforts around the Reservoir, the species was sparse but still present early in the growing season (1 to 5% cover). Additional RCG manual removal occurred during July and August with a result of no remaining RCG either within the mitigation area or elsewhere along the Reservoir shoreline. Milfoil expanded in spite of removal efforts and averaged 7.6% cover.

Conclusion: Non-native invasive species cover ranged between 0% in the Culvert area to approximately 1% in the HW area and 7.6% in the Reservoir area. The success criteria were met for each of the individual areas and overall.

[2]Where the alder formed a clump, only the clump was counted, and only the second year or vigorous naturally-establishing cottonwood or willows were tallied.

4.6 Success Criteria 3: Wetland Cover

Native herbaceous plants will cover 33% of the Upper Reservoir area at or below the OHW line.

Although cover is regularly examined in all areas to ensure that it remains on track to meeting the final native cover requirement, the Reservoir mitigation area is the only area in which there is a cover requirement in Year 2. The native cover status of each mitigation area was provided in Section 4.2, with only the Reservoir area native cover discussed below.

Cover of a number of native herbaceous plants increased in the Reservoir area (such as both the planted and volunteer sedges, water-plantain, spikerush and cattail). Conversely, the bulrush sod cover declined as waterfowl herbivory substantially impacted the species, reducing its cover to 10%. The biggest difference between the reversal of bulrush to cattail cover was that the cattail expanded in extent within the shallow marsh, but not in the deeper marsh where the bulrush had established. As a result, the deep marsh native cover declined to a mean of 7%, while the shallow marsh native herbaceous cover increased to 42.7%. The total native herbaceous cover was 33.2%.

Conclusion: The native herbaceous cover for all areas below the OHW was 33.2%, meeting the Year 2 success criterion. However, the bulrush decline in the deeper marsh areas may prevent subsequent year cover requirements from being met (40% herbaceous cover in 2019, 80% total cover by 2021)

5.0 SUMMARY AND SCHEDULE

5.1 SUMMARY

The staggered mitigation was completed in Fall 2017 and Spring 2018 with full area monitoring and maintenance during the 2018 growing season. Because of the staggered implementation, the success criteria for the HW area (Year 1 criteria) differed slightly from the success criteria for the Culvert and Reservoir areas (Year 2 criteria, see Table 3).

Overall, the mitigation area exhibited high woody species survival (from 83.6 to 100% in most areas) and/or density (exceeding targets), and mostly very high vigor. The exceptions were in the HW-2, 2016-graded subarea where woody plant vigor was lower, and the Reservoir area where survival was less than 80%, but because of naturally-establishing alders, the applicable Year 2 density criterion was met.

Non-native invasive species cover was below 10%, with no RCG or tansy in the Reservoir or Culvert areas, and only limited amounts in the HW area. The buffer areas were well maintained to prevent non-native invasive species expansion into the mitigation areas.

Table 3. Evaluation of the Degree to which Success Criteria were met in 2018.

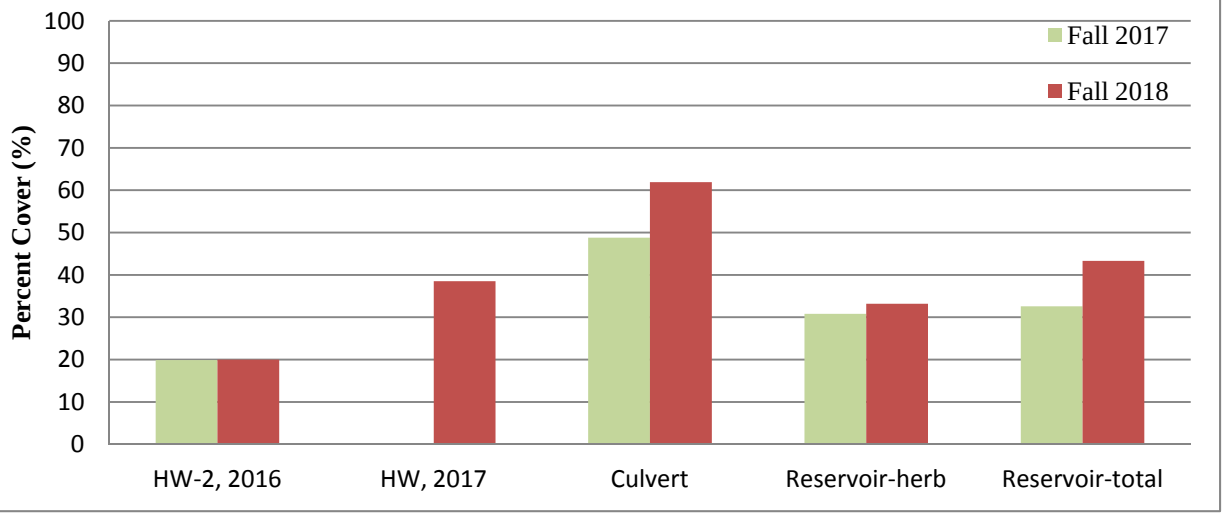
Success Criteria	Results	Evaluation
1a. HW area planted species survival of 80%	Survival ranged between 93.6 to 100%.	Success criterion met.
1b. Native woody species to achieve target densities of : 435 woody plants/acre (Culvert) and 1,393 woody plants/acre (Reservoir).	 Density of 983 stems/acre Density of 2,691-5,937 stems/acre.	 Success criteria met in both areas.
2. No more than 10% cover of non-native invasive weeds.	Non-native invasive weed cover from 0 to 7.6% depending on the mitigation area.	Success criteria met in all areas and overall.
3. Reservoir native herbaceous cover to be at least 33%	Native herbaceous cover was 33.2%	Success criterion met Subsequent year success criteria of 40-80% may require additional effort to meet.

Specific cover criteria were required only for the Reservoir area. The required native herbaceous cover of 33% was met, although just barely at 33.2%. Subsequent year success criteria of 40-80% may require additional effort to meet.

All 2018 success criteria were met.

There are no set cover requirements for the other mitigation areas until Year 5. However, cover is regularly tracked to ensure progress toward the end goals. Figure 4 displays the total native cover for all mitigation areas, grouping the HW into those areas in which mitigation was completed in 2016 and those in which mitigation was completed in 2017.

Figure 4. Total 2018 Native Cover in the Different Mitigation Areas and Subareas.



In addition to highlighting the Reservoir area cover, key points from Figure 4 (and the associated data presented in Section 4.2) include:

- Although non-native invasive cover was low in the HW area, native cover was also relatively low and quite variable. The cover variability generally reflected the difference between areas in which the seeded grasses and other native species established and where the trefoil-clover mix dominated.

- Native cover was particularly low in the HW-2, 2016 subarea.

- The Culvert area native cover is 61.9% greater than the required Year 5 cover of at least 50% from plants within the mitigation area (with the remaining cover provided by an existing canopy).

Some measures to increase the native cover requirement, increase the HW-2, 2016 shrub cover and vigor, and ensure the required 2019 required progress towards the Year 5 goals are described in Section 5.2.

5.2 RECOMMENDATIONS AND 2019 REMEDIAL MEASURES

The primary items of concern discussed in this section are those that could prevent subsequent year criteria from being met, such as long term woody plant survival, the 80% native cover requirement, and the increased Year 3 Reservoir native herbaceous species cover requirement. Measures to reduce long term maintenance needs by increasing the ability to shade out, rather than continually weed non-native plants, are also included. These items are:

- High trefoil-clover cover in the HW area.
- Lower than desired woody plant vigor in the HW-2, 2016 graded area.
- Low woody plant survival in the HW-1 and HW-2 upland buffers.
- Decrease in deep marsh cover in the Reservoir area.

Each of these items is discussed separately below, with the measures incorporated into the 2019 maintenance and monitoring schedule in Section 5.3.

5.2.1 HW Trefoil-Lotus Cover

Issue: The non-native trefoil and clover mix is being treated as an early seral, allowable ground cover that is providing beneficial soil stabilization and one that will not persist over the long term (i.e., non-native, but not non-native invasive). It is not included in the non-native invasive species cover calculations, and is helping prevent RCG from re-establishing. However, it is also preventing a native herbaceous understory from developing and in some places was interfering with planted tree/shrub growth. Several measures are proposed to address this situation:

Recommended Actions:
(1) Overseed the area in Fall 2018 with additional native seed to allow increased opportunity for native grass establishment in early spring prior to initiation of the trefoil-clover growth.

(2) Continue clearing out the planting basins in 2019 as was done during mid-summer 2018 to allow irrigation water to get to the desired plants and not support the trefoil-clover mix. However, avoid this clearing where native plants have established without interfering with shrub growth. Post-weeding, check the irrigation lines to make sure that, if dislodged, they are restaked to ensure that the water remains directed at the target plant and not patches of trefoil-clover mix.

(3) At irrigation start-up, and periodically, check all lines, connections and the tank outlet/manifold for leaks, as the clover and vetch exhibited very high growth around the initially leaky tanks and connections.

(4) If necessary, replace some of the pre-perforated irrigation lines with self-perforated lines to ensure water supply only to the desired species and not the non-natives in between. Likewise,

reduce the irrigation pressure to avoid overspray and implement tighter control of the zoned nature of the irrigation system to ensure that the desired water amounts are applied appropriately.

(5) Evaluate how well the exclosures promote both woody plant growth and shading of the trefoil-clover in 2019 to identify if additional measures to reduce the trefoil-clover cover are necessary within the exclosures.

(6) Once irrigation has been completed, remove the drip lines, and if reseeding is necessary, selectively remove the trefoil-clover and drill seed the native species mix to allow greater soil-seed contact and germination.

5.2.2 HW2, 2016 Graded Low Vigor

Issue: The lower than desired subarea vigor can be attributed to very heavy trefoil-clover mix growth, both in the planting basins and climbing up the anti-herbivory cages, and a late irrigation start which resulted in woody species die-back.

Recommended Actions: Recommendations are similar to those listed in Section 5.2.1 to reduce the trefoil-clover mix competition, increasing the planting basin clearance from 6-8 inches to 12 inches, and continuing irrigation for another year to re-establish the shrub vigor. Irrigation must start much earlier to coincide with the water table decrease rather than trying to restore vigor later.

It will be particularly important in this area to reduce the line pressure where overspray is occurring and/or replace the pre-perforated lines to ensure that (1) only the planted shrubs get irrigation water, and (2) that deep soil penetration occurs to promote the desired deep root growth.

In addition, three more conifers (lodgepole pine) will be planted in the area to assist with shading of the competing trefoil-clover mix.

5.2.3 HW-1 and HW-2 Upland Buffers

Issue: Ponderosa pine was selected as the species to use in the upland buffers to shade out non-native species as it is one of the faster growing conifers. However, the areas were generally compacted and the soil quality poorer than the pine could tolerate. Its survival was low.

The willows in HW-1 also did not survive. A seasonal low water table with no establishment assistance via irrigation was likely the cause, along with shade from existing plants. However, with the aggressive RCG and tansy cutting, the existing meadowsweet, snowberry and Bebb's willow were released and increased their cover.

Recommended Actions: Replant the buffers with the slower growing, but more tolerant lodgepole pine and maintain a clear planting basin around them where needed. In lieu of replanting the willows, continue RCG and tansy cutting to both prevent seeding into adjacent areas and allow existing native shrubs to continue expansion.

5.2.4 Reservoir Deep Marsh

Issue: The native herbaceous cover for all areas below the OHW was 33.2%, meeting the Year 2 success criterion. However, the bulrush decline in the deeper marsh areas may prevent subsequent year cover requirements from being met (40% herbaceous in 2019, 80% total cover by 2021).

Recommended Actions: It is possible that the bulrush may recover from the waterfowl damage, or that other native plants may expand into the deep marsh if no additional damage occurs. The need for remedial planting should be re-assessed in early 2019 to allow the potential for bulrush recovery to occur. The following steps are recommended:

(1) Beginning in April, record the staff gage levels on a weekly basis to identify if the reservoir water level is again higher than usual. At the same time, note any prolonged early spring waterfowl use, especially by Canada geese.

(2) If water levels remain high, begin to draw the water down to reach a level of less than 3.3 feet at the upper gage by early May, with subsequent drawdowns of 0.1 feet/week (or as prescribed by the Wetland Scientist for exact May site conditions). Use this water for the HW irrigation.

(3) If there is prolonged Canada geese lingering, it may be possible to discourage their use (and associated herbivory) by periodically running the recirculating pump to provide some mild background noise.

(4) Provide an assessment of bulrush recovery/other native species growth in June to identify if replanting may be necessary.

(5) If re-planting is needed, immediately install anti-goose herbivory protection.

5.2.5 Monitoring Protocol

As noted in Section 5.1.1, the linear shrub plot specified in the Detailed Plan failed to adequately characterize the shrub layer in the HW area and was changed to a circular plot (15 foot radius). This change will be permanently incorporated into the monitoring protocol for the HW area. The linear plots are suitable for the linear woody habitats at the Reservoir, with the circular plots more appropriate for the broader HW riparian area.

Additional 1 m^2 plots were added again in 2018 to address the patchiness of the herbaceous cover, in the HW-2, 2016 subarea, but not in the remaining HW area where patchiness also occurs. A Steins Two-Stage analysis (see for example, Zar 1984) was conducted to identify, given the existing variability in cover, how many 1 m^2 plots would be necessary to accurately identify key species cover values at confidence levels of 0.05 and 0.10. The numbers were 61 and 42 plots, respectively. Achieving the 0.10 confidence level could easily be achieved by increasing the number of 1 m^2 plots from 3 to 5 per data point. This change is recommended, with the additional plots added along a transect oriented in a perpendicular direction to the data point (as compared to

the existing plots that are oriented in a parallel direction). To obtain greater accuracy, two more data points may be added which would provide 60 herbaceous plots.

5.3 2019 Schedule

Planting of 25 lodgepole pines to increase shading of non-native species will occur in the spring (likely April) in the HW-1 and HW-2 upland buffers and in HW-2, 2016 graded.

The primary maintenance tasks in 2019 will be weed control and irrigation, with the greatest emphasis on the HW area. Weed control activities will need to include the following:

- Periodic cutting of RCG and tansy in the HW-1 buffer area and adjacent to HW-3a and 3b, beginning approximately mid-June (depending on annual phenology), with a second cutting 30 to 45 days later, and thereafter as necessary to prevent flowering/seed set.

- Manual removal of any establishing RCG, tansy and creeping foxtail in the HW areas. The HW weed removal is best accomplished under moist, but not wet, soil conditions. These conditions will likely occur in May for HW-2 and HW-3b, and June and July for HW-3a.

- Manual removal of any new RCG around the reservoir. If necessary, some removal can occur in May. Otherwise, any necessary weed removal is best accomplished midsummer. At this time, milfoil removal will also occur, as necessary. The effort needed around the Reservoir is likely to be minimal and should be conducted via a water-based access to prevent trampling of shoreline native plants.

All of the HW area will require irrigation in 2018 according to the following guidelines:

- It will be imperative for irrigation to start in the spring as the water table begins to decline and not later in the season. The later start will not promote deep root growth.

- Prior to irrigation initiation, the irrigation system will need to be checked for any leaks and all connections sealed. The irrigation system check will need to occur by late April with irrigation ready to start in May, with the actual start date dependent on the seasonal soil moisture level (as estimated from either the ground water wells or the depth of water in the HW stream channel).

- During the irrigation period of May/June to September, ongoing checks for leaks and overspray supporting the trefoil-clover mix will be necessary. Reduce the irrigation pressure to avoid overspray and implement tighter control of the zoned nature of the irrigation system to ensure that the desired water amounts are applied appropriately.

- Concurrent with the irrigation, the planting basins around the planted trees and shrubs will need to be kept free of the lotus-clover mix in HW-2, 2016 and HW-3a, with clearing only

as necessary in the HW-2, 2017 and HW-3b subareas where seeded grasses have established without interfering with woody plant growth.

- Although not irrigated, small weed-free basins will also need to be cleared around the upland conifers and the red cedars planted at the reservoir.

No irrigation will be needed at the Culvert and the irrigation lines should be removed in May, prior to herbaceous species emergence to prevent any inadvertent trampling. At this time, removal or slitting of unnecessary anti-herbivory cages should occur.

The ability of the bulrush sod to recover from goose herbivory will need to be carefully monitored in 2019. Beginning in April, HF staff will need to watch reservoir water levels and waterfowl use to determine if any spring water level drawdowns or goose deterrent measures need to be implemented. A determination of any necessary herbaceous replanting needs will be made in June or early July.

Monitoring will continue in 2019, with data collected in all mitigation areas. The data collection will be the same for both 2016 and 2017-completed areas, as the woody plant success criteria change to density for all areas, and all areas must show progress towards meeting the Year 5 native cover goals. The Culvert and Reservoir areas will be compared to the Year 3 success criteria. Conversely, the HW areas will be compared to the Year 2 success criteria.

Table 4. 2019 Mitigation Implementation and Monitoring Schedule. Except for deliverable dates, all dates are approximate and weather or site condition-dependent.												
Task	**Month**											
	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Maintenance												
Check all tanks, irrigation lines and connections in preparation for irrigation				X								
Check reservoir staff gage and draw down water level as necessary				X	X	X						
Run irrigation-all HW areas and check hoses for leaks; repair as necessary					X	X	X	X	X			
Removed unneeded driplines and cages in Culvert area					X							
Clear HW planting basins						X	X	X				
Clear Buffer planting basins					X		X					
Weed Control-HW mitigation areas					X	X	X	X				
Weed Control HW-1 Buffer and adj to HW-3a and 3b						X	X	X				
Weed Control-Reservoir					X		X	X				
2019 Remediation												
Plant HW-1 and HW-2 supplemental plants			X	X								
Implement geese deterrent noise, if necessary					X	X	X					
Identify if Reservoir replanting necessary						X						
Replace dead plants, if necessary, and add anti-geese protection							X	X				
Implement Contingency				As, or if, necessary								

Table 4 (continued).												
Task	**Month**											
	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Monitoring												
Spring					X							
Mid-Summer						X						
Late Summer								X	X			
Memo submission					X				X			
Annual Report												X

6.0 REFERENCES

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APPENDIX A

BONNER'S FERRY, IDAHO WETS STATION WEATHER DATA

Table A-1. Comparison of Long Term Monthly and Annual Precipitation and Temperature from the Bonner's Ferry, Idaho WETS Station to the Actual Monthly Total Values for 2015, 2016 and 2017. Missing values represent data that have not yet been collected.

Month	Temperature ˚ Fahrenheit					WET-Bonner's Ferry						
	30-Year Average	2015	2016	2017	2018	30-Year Average (inches)			Individual Year Monthly Totals (inches)			
						Average	30-70% Range		2015	2016	2017	2018
Jan	28.1	29.0	30.1	20.8	30.5	2.70	1.62	3.28	2.34	2.64	1.48	3.97
Feb	31.4	37.7	36.9	28.6	26.7	1.77	1.12	2.14	2.90	1.56	7.06	1.55
March	39.4	42.7	41.2	37.9	37.3	1.49	0.93	1.80	3.89	3.48	4.58	1.51
April	47.2	47.1	53.8	45.0	54.4	1.42	0.86	1.73	1.06	0.38	2.08	2.66
May	54.3	59.9	58.3	56.0	62.0	1.76	1.07	2.12	1.21	2.08	1.08	0.59
June	61.6	69.0	62.7	63.2	61.1	1.62	1.07	1.95	0.81	1.04	1.35	2.04
July	67.5	71.4	67.7	74.0	69.8	1.02	0.53	1.27	0.43	0.70	0.01	0.12
Aug	66.9	70.5	69.2	72.4	68.9	1.07	0.48	1.31	0.99	0.23	trace	0.50
Sept	57.4	57.6	57.8	60.4	57.4	1.16	0.58	1.42	0.51	1.19	0.80	0.77
Oct	45.4	51.4	46.5	44.6	45.3	1.61	0.79	1.97	0.73	7.99	2.71	1.50
Nov	35.0	34.9	41.0	35.7	--	3.03	1.82	3.68	3.60	1.81	4.32	--
Dec	26.8	30.8	23.4	26.5	--	2.91	1.89	3.50	5.90	3.92	3.41	--
Total	47.0	50.2	49.0	47.2	--	21.56	18.76	23.84	24.37	27.02	28.88	--

APPENDIX B

PLANTING TABLES

Table C-1. Woody Plants Placed in the Highland Flat Farm Mitigation in 2016 and 2017, absent extra bundle plants*.														
Mitig Area	**Habitat**	**Bare Root Shrubs and Trees**												
		Alin	**Cose**	**Crdo**	**Pico**	**Pipo**	**Poba**	**Potr**	**Saex**	**Sabe**	**Spdo**	**Syal**	**Thuja**	**Total**
Fall 2016														
HW-2/upper 3a							18		32			50		100
Culvert	PFO/PSS	32	42				30							104
Reservoir	PSS								50					50
Reservoir	PSS-Exper								50					50
Total Fall 2016		32	42				48		132			50		**304**
Spring 2017														
HW-2/upper 3a	Mesic Rip										140			140
Culvert											10			10
TotalSpring 2017											150			**150**
Fall 2017														
HW2-2017 Gr	Mesic Rip										104	36		140
HW-3a	All		37	30			94	11			310			482
HW-3b	All			20			3	14			60	193		290
HW-1	Suppl													0
HW-2 2016 gr	Suppl													0
Culvert	Suppl		3				2							5
Reservoir	Suppl													0
Total Fall 2017		**0**	**40**	**50**	**0**	**0**	**99**	**25**	**0**	**0**	**474**	**229**	**0**	**917**
Total 2016/2017		**32**	**82**	**50**	**0**	**0**	**147**	**25**	**132**	**0**	**624**	**279**	**0**	**1371**

* Total without experimental willows=1321

Table C-2. Woody Plants Placed in the Highland Flat Farm Mitigation in Spring 2018, absent extra bundle plants.														
Mitig Area	**Habitat**	**Bare Root Shrubs and Trees**												
		Alin	**Cose**	**Crdo**	**Pico**	**Pipo**	**Poba**	**Potr**	**Saex**	**Sabe**	**Spdo**	**Syal**	**Thuja**	**Total**
HW2-2017 Gr	Mesic Rip				15	6			33		4	21		79
HW-3a	All				7				8	91			7	113
HW3b	All					9				7				16
HW-1	Suppl					10			9					19
HW2-2016 gr	Suppl				3									3
Reservoir	Suppl												3	3
Total Spring 2018		**0**	**0**	**0**	**25**	**25**	**0**	**0**	**50**	**98**	**4**	**21**	**10**	**233**

APPENDIX C

2018 REPRESENTATIVE PHOTOPOINTS

Figure C-1. Comparison of the new grass growth in HW-2, 2016 graded in spring 2018 (top) to the more patchy fall 2018 grass-clover dominance (bottom).

Figure C-2. Transect 2 photopoint looking north at HW-2, 2017 graded (top) and south at HW-2, 2016 graded (bottom).

Figure C-3. HW-2, 2017 graded looking south from DP HW-3 and showing high meadowsweet vigor (top) and looking north at the HW-1 buffer from the farm road in which ongoing maintenance removed plants/prevented RCG and tansy flowering (bottom).

Figure C-4. HW-3a, looking north from DP HW-5 (top) and DP HW-6 (bottom) in HW-3a depicting high planted shrub vigor but mixed native-trefoil/lotus understory.

Figure C-5. Looking south from DP HW5 in HW-3a.

Figure C-6. Comparison of DP HW-9 in HW-3b looking north in June 2018 when *Montia linearis* was the dominant understory species (top), and in September, post-exclosure construction with volunteer cottonwood growth (bottom).

Figure C-7. Comparison of volunteer cottonweed growth between July 2018, immediately pre-exclosure (top) and 6 weeks later in September 2018 (bottom) looking east at the first exclosure from the HW access road .

Figure C-8. Close-up of volunteer cottonwood growth in exclosure 1 (top) and the narrow ungulate path to the larger riparian wetland between exclosures 1 and 2 (bottom).

Figure C-9. Culvert area shrub growth in September 2018 looking southwest (top) and east (bottom) from Culvert PP3.

Figure C-10. Culvert area shrub growth in September 2018 looking northeast from Culvert PP4, showing planted shrubs far outgrowing their cages (top) and at the RCG removal area with black plastic barrier to prevent future encroachment (bottom).

Figure C-11. Upper Reservoir cover comparison between Spring 2017 (top) and Fall 2018 (bottom) looking north at PP5 .

Figure C-12. Reservoir cover looking south from PP5 in 2017 (top) and in 2018 (bottom) showing alder and cattail cover increase, and generally similar herbaceous cover but some species dominance change.

Figure C-13. Bulrush sod patch in Fall 2017 (top) and a close-up of the same patch in Fall 2018 (bottom) depicting waterfowl herbivory.